



Green Business Expo Presentation

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The Evolution of Fuel



Introduction

Warren M. Surcouf III

Vice President of Business Development

The Evolution of Fuel

Cerion Energy



Formed in 2007, Cerion is located in Rochester, NY.



Cerion currently has 43 employee's (expected to be over 100 by end of 2011). Among them we have 10 full-time PhD former Kodak material scientists.



Manufacturing plant located in Eastman Kodak Business Park



What is Nanotechnology?

- The science of creating man-made functional systems that perform work on an atomic or molecular scale.
- Advantages of nanoparticle structure:
 - Maximized surface area
 - Reduced migration distance
 - Improved reactivity for oxygenation, combustion

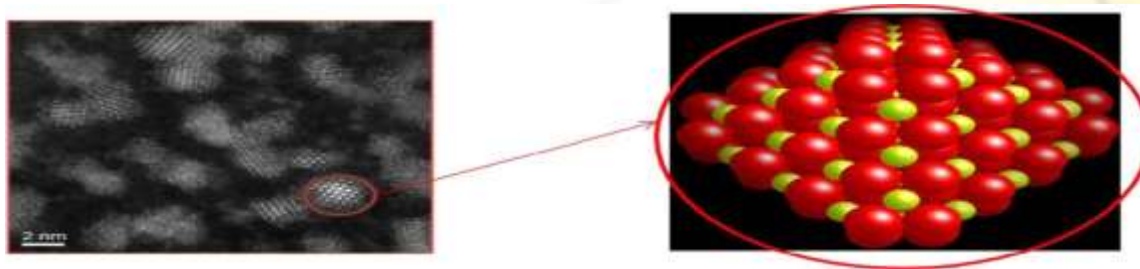


Image of the active particle in GO_2 . The particles are 2.5 nanometers in size. You can fit 40,000 of these particles on the tip of a human hair.

An Expanding Range of Applications

- Combustion catalysts for boosting fuel economy and reducing emissions
- Surface treatments for conditioning substrate surfaces
- Clothing treatments for combating odor-causing bacteria
- With additional uses on the technology roadmap, including:
 - Power storage and fuel cell catalysts
 - Biologics
 - Chemical catalysts



Introducing GO₂

Hudson Ansley

CEO

The Evolution of Fuel

➤ Our biggest challenge in the marketplace is all the solicitations from “snake oil companies” with no real science or actual field verified test results.



Introducing GO₂...

- Cerion Energy's Diesel Combustion Catalyst
- GO₂ Diesel Fuel Optimizer (GO₂) reduces fuel consumption and greenhouse gas emissions in a variety of diesel vehicles
- GO₂ is created by Cerion scientists, formerly of Eastman Kodak, who collaborated to put their nanotech research to work.



GO₂ Deliverables

8 to 14 % Reduction in Fuel Consumption

8 to 40 % Reduction in Greenhouse Gases*

— CO₂, CO, NO_x, & Total HydroCarbons (THC)

25 to 35% Reduction in Soot

*depending on specific gas

Return on Investment (ROI)

If you use 10 Million Gallons of Diesel per year and are spending about \$30 Million per year on fuel, then you will save approximately **\$2,400,000 to \$3,600,000** annually in fuel costs.

At the GO_2 cost of 14 cents per treated gallon, net savings to your business would be **\$1,211,820 to \$2,463,480.**

Price and volume discounts can be available to enhance your first year savings.

Fuel Savings of 8 to 12%
\$3.20 / gallon diesel fuel

What is Cerion GO_2 ?

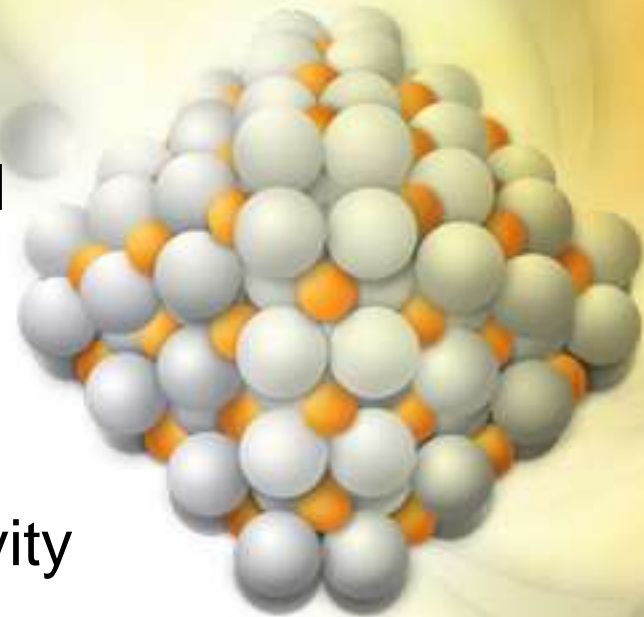
How does GO_2 work?

GO_2 Performance

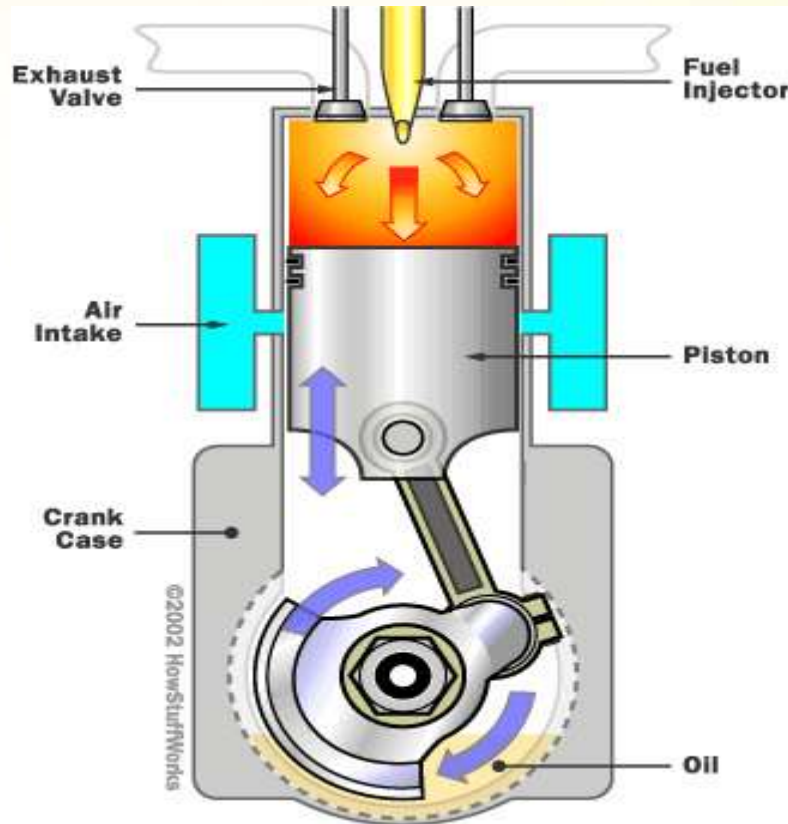
GO_2 In Your Operation

What is Cerion GO₂?

- Liquid suspension of highly reactive Nano-Particles, added directly to diesel fuel supply
- Based on a Cerium Dioxide crystal enhanced with other elements to increase its reactivity
- Each particle is 2 to 10 nanometers, or about the width of your DNA!
- 1 gallon of Cerion GO₂ treats 4,000 gallons of diesel fuel



Diesel Engine Design Limitations



- Fuel is not pre-mixed with air like in gasoline engines
- Result is an uneven distribution of oxygen in fuel
- In areas of high oxygen NO_x is created
- In areas of low oxygen unburned HC (soot) is created

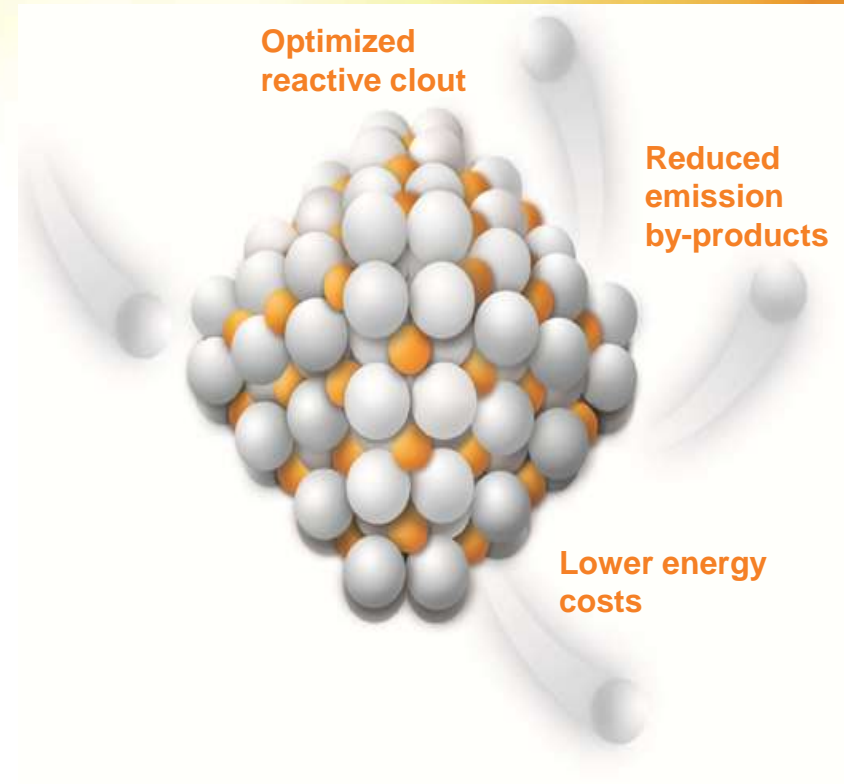


Real Science, Real Results



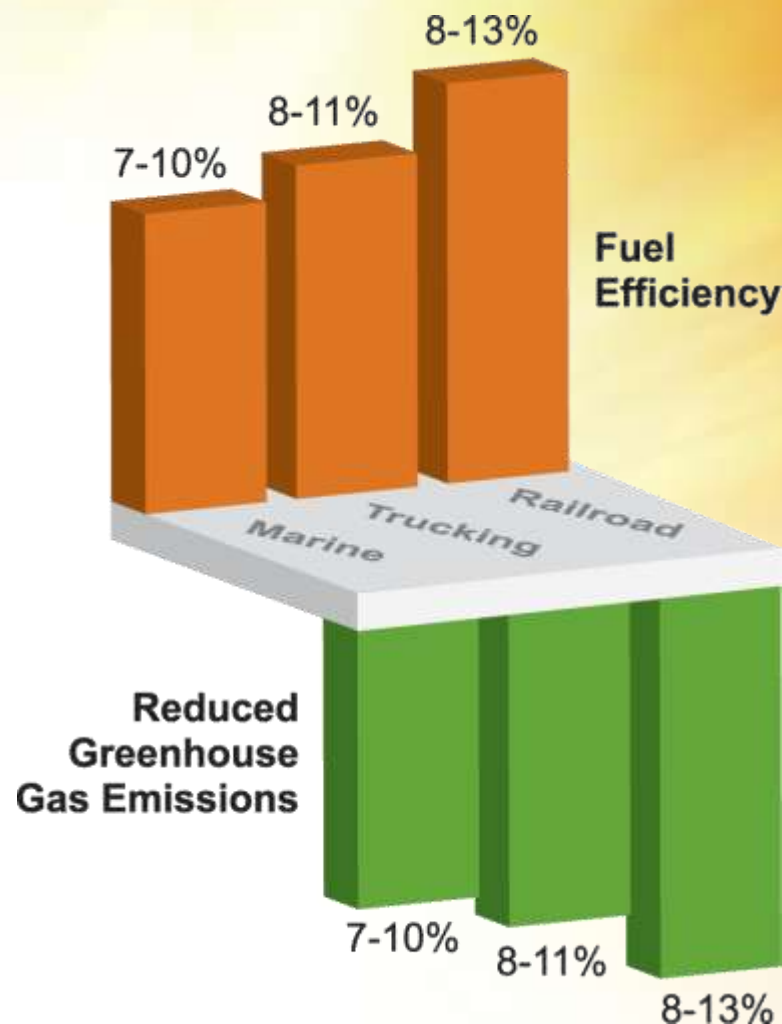
Layman's Terms

- Releases and contributes Oxygen to areas starved for it
- Next scavenges Oxygen from Oxygen rich regions and distributes throughout the chamber
- This cycle occurs over 100 million times per nanoparticle, per combustion event (less than 2 milliseconds)
- Creates more uniform dispersion of Oxygen, more rapid and complete combustion with less emissions



Impressive Results in Marine, Rail & Transportation

- Fuel efficiency gains that reduce operating costs
- Particulate emission reduction to 40%
- Increased power, reduced engine deposits
- Improved fuel lubricity reduces engine wear



GO₂ Platforms



GO₂



Example GO₂ Platforms

Engine	Cummins K19	GE 7FDL-12	Cat 3512	Detroit 671
Cylinders	Inline 6	V-12	V-12	Inline 6
Displacement	19 L	132 L	52 L	7 L
Cycle	4-stroke	4-stroke	4-stroke	2-stroke
Intake	Turbo	Turbo	Turbo	Roots Blower
Horsepower	500	2250	1750	238

Your fuel will stay within ASTM and Manufacturers' specifications.

Analysis at Southwest Research Institute proved that fuel treated with GO_2 will continue to meet all required physical and chemical specifications.

Increased Lubricity

Fuel injector abrasion tests at SwRI showed a 40% reduction in wear with GO_2 .

Southwest Research Institute

GO₂ Fuel Optimizer: Effect on Diesel Fuel Properties

Users of fuel additives must be aware of potential changes to fuel properties. With a dosing ratio of 4000:1, the amount of GO₂™ additive is extremely low and many fuel properties are essentially unchanged. Third party test lab results (Table 1) do show an improvement in the lubricity of the fuel, leading to smaller wear scars.

Table 1: Effect of GO₂ Diesel Fuel Optimizer on Fuel Properties

ASTM Test Procedure	Change in Diesel Fuel Properties**
Cetane Number (D613)	+0.4 / (+0.84%)
Flash Point (D93)	+ 2 / (+1.29%) °F
Pour Point (D97)	0 °C
Density by hydrometer at 60 °F (D287)	0 API gravity
Viscosity @ 40 °C (D445)	- 0.003 / (- 0.11%) centiStokes
	-5 / (-12.5%) kPA
D2068 Filter Plugging Tendency, Procedure A	0 Vol, mL
	- 0.02 / (-1.87%) FPT
Cloud Point (D2500)	+0.1 / (+0.49%) °C
Lubricity by HFRR (60oC) (D6079)	
Major Axis	- 0.184 (-39.7%)*** mm
Minor Axis	- 0.161 (-39.6%)*** mm
Wear Scar Size	- 0.172 (-39.5%)*** mm
Description	Lightly abraded oval (treated fuel) vs. Circular, heavily abraded (control)

* Detailed SouthWest Research Institute (SWRI) test results are available from Cerion Energy, Inc.

** (GO₂ Treated Diesel Fuel – Control) / (%Change)

*** Negative numbers indicate lower wear and higher lubricity

Conclusions: GO₂ can be added to your current diesel fuel without changing the key properties. Fuel that is already within the specification range for your engine will continue to meet these requirements.

Southwest Research Institute

Table II shows diesel fuel specifications for EMD Engines & ASTM D2880-03 specifications as cited by the Caterpillar Guide. Included in this table is a comparison to GO₂ third party test results. Since the addition of GO₂ did not impact diesel fuel properties, blending this material with diesel fuel that meets the manufacturer's specifications, such as #2D-5000, #2D-S500 or ASTM D2880, will result in a fuel that continues to meet these specifications.

Table II: Summary of Specifications for Fuel Oil Compared to Cerion Treated Fuel

Property and Test Method	Spec. #2D - S5000*	ASTM Spec D2880-03 For No. 2-GT Fuel	GO ₂ Treated Diesel
Cetane Number (D-613)	> 40	N/A	47.7
Cetane Index (D-4737)	> 40	N/A	42.4
Density @ 15°C (D-4052) kg/m ³	820 - 860	<876	855.3
90% Boiling Point (D-86)	< 650°F	N/A	599.4
Final Boiling Point (D-86)	< 700	N/A	646.6
Distillation Temperature 90% Volume Recovered (D-86) (°C)	N/A	282 – 338	315.2
Distillation Recovery (D-86)	> 99.00%	N/A	98% (unchanged from diesel fuel control)
Total Sulfur (D-2622)	0 - 0.50%	N/A	0.014 (GO ₂ only)
Copper Strip Corrosion (3 hr. @ 100°C) (D-130)	No. 2 strip or better	N/A	1a strip
Conradson Carbon Residue (on 10% bottoms) (D-189)	0 - 0.35%	0-0.35***	0.03***
Water and Sediment (D-1796)	0 - 0.05%	0-0.05	<0.02
Cloud/Pour Point (D-2500, D-97)	Cloud - 10°F (below the lowest expected fuel temp)	<-5 °C	-20.2 °C/-4 °F
Flash point (D-93)	Normally >150°F	>100°F	155
Organic chlorides (U.O.P. Method No. 588-65) (total chloride)	0 - 20 ppm	N/A	Not tested****
Filtration Cleanliness (EMD Std. Lab. Practice No. 102) (Ash residue on 0.80 micron filter)	0 - 1.3 mg/L	N/A	No change from diesel fuel control (D-2068 filter plugging test)
Viscosity (D-445) at 40°F	1.9 - 4.1 cS	1.9 – 4.1 cS	2.782 cS
Ash, Weight % (D-482)	0 - 0.02%	<0.01%	<0.001%
Lubricity (D-6079) (HFRR wear scar diameter @ 80°C, mm)	0 - 0.52	N/A	0.263

* For EMD Engines. EMD specifies test procedures in "ElectroMotive Maintenance Instruction" M.I. 1750 Rev. 1, p. 6 (2005).

** For Caterpillar Engines. Caterpillar specifies test procedure ASTM D2880 No.1-GT & No.2-GT in "Diesel Fuels & Diesel Fuel Systems: App. & Installation Guide", p.6 (2005).

*** Ramsbottom Carbon Residue is specified in ASTM D2880 & was run for the Cerion Treated value. Conradson Carbon Residue is calculated based on the conversion curve in ASTM D524-09.

**** Organic chlorides are not used in the production of GO₂.

GO₂ Field Demonstrations



- The only company in the market investing in well-defined, accurate, live customer tests.
- Each test is customized around the customer's situation and needs.
- Cerion provides the GO₂ product, testing team and (if needed) testing equipment for these demonstrations.

Please visit our booth for hard copies of the demo reports...

GO₂ In Your Operation

Treatment Options that Fit Your Needs:

- Splash Blending at individual vehicle refueling for small or remote operations
- Bulk treatment of your on-site fuel supply tanks for full-fleet implementation
- On-board injection into fuel stream for operator-free treatment
- Pre-treated fuel delivered by a partner regional fuel supplier for large fleet operations

Cerion GO₂ provides
commercial diesel fleet operations
an 8-14% reduction in fuel
consumption and 8-40% decrease
in greenhouse gas emissions

Steps for a Fuel Efficiency Field Demonstration

1. Survey
 - a. Determine what testing equipment to use
 - b. How to setup on engine
 - c. Fuel dosing protocol
2. *Measure Baseline Engine Performance
 - a. Set up of equipment (typically 1-2 hours)
 - b. Test at 2-3 RPM's (1-2 hours)
 - c. Tear down of equipment (1 hour)
3. GO₂ Additive Run Time (typically 150 – 200 hours)
4. *Measure Additized Engine Performance
 - a. Set up of equipment (typically 1-2 hours)
 - b. Test at 2-3 RPM's (1-2 hours)
 - c. Tear down of equipment (1 hour)
5. Data Analysis
 - a. Normally 1-2 weeks to generate a final report and analysis

**See next page for normal testing protocol.*

Standard Test Protocol for Emissions Field Demonstration

Identify vessel to test on. Optimally twin screw vessel with ability to separate fuel for each engine (tiger/day tank can optionally be provided for test).

1. Set up of testing equipment.
 - a. KRAL fuel flow meters (1 hour)
 - b. PEMS (6-8 hours)
2. Test at 2-3 RPM's
 - a. Initially run engine at high RPM for 10 minutes
 - b. Run 4 rounds of each agreed upon RPM for 10 minutes (first 5 minutes for engine to equilibrate, second 5 minutes of actual data collection).
3. Tear down of equipment (1 hour)



Real Science, Real Results



Recent GO₂ Accomplishments

- Cerion Energy finished 1st in the grading of the 2010 DEQ Green Business Expo
- Omni Marine Services' demonstration of GO₂ was finalist for the 2010 International WorkBoat Show Environmental Initiative Awards.
- Superyacht Business published an article on the benefits of using Cerion Energy's GO₂ in super- and mega-yachts. Click [here](#) to read the Super Yacht Business article.
- The Rochester Business Journal recently published an article on Cerion Energy. To read the article on the Rochester Business Journal's website, please click [here](#).
- Cerion Energy's press release on GO₂ has been picked up and posted on MSNBC.com. Please click [here](#) to read at MSNBC.com.

Q & A



Please visit our booth for more information on how Cerion can help your business save money.

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